Weak Crossover and the Direct Association Hypothesis

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Outline

Weak crossover

Two LFG treatments

Bresnan 1995 (trace-based)

Dalrymple, Kaplan & King 2001 (traceless)

Direct association

Additional data

Pied-piping

Double-object constructions and objectivity distinctions

Adjuncts and syntactic prominence

Multiple gaps

Conclusions

Directions for further inquiry

Synthetic data

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Weak Crossover (Postal 1971, Wasow 1972)

Transformational grammar regards $wh$-questions as formed when a $wh$-operator is fronted. A weak crossover “violation” occurs in cases like (1), when the operator must pass over a coreferential pronoun on its way to the head of a sentence.

Example (1)

a. His; mother greeted him;

b. *Who; did his; mother greet?
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Example (1)

a. His; mother greeted him;.

b. *Who; did his; mother greet?

The acceptability difference only occurs when operator movement would involve crossing the pronoun: both examples in (2) are acceptable as indexed.

Example (2)

a. He; greeted his; mother.

b. Who; greeted his; mother?
Bresnan’s (1995) account of weak crossover

Bresnan represents traces in the c-structure of an example like (1)b (based on the treatment of long-distance dependencies in Kaplan & Bresnan 1982). Traces therefore also correspond to an f-structure, and in particular the same f-structure as the operator.
C- and f-structures for (1)b (Bresnan)

Example (3)

a. *Who\textsubscript{i} did his\textsubscript{i} mother greet?

b. 

\[
\begin{array}{c}
\text{CP} \\
\text{NP} \quad \text{C'} \\
\text{C} \quad \text{IP} \\
\text{NP} \quad \text{I'} \\
\text{Det} \quad \text{N} \quad \text{VP} \\
\text{his} \textsubscript{i} \quad \text{mother} \quad \text{greet} \\
\end{array}
\]

c. 

\[
\begin{array}{c}
PRED \\
FOCUS \\
SUBJ \\
OBJ \\
\end{array}
\]

\[
\begin{array}{c}
\text{f}_1 : \left[ \begin{array}{c}
PRED \text{‘pro’} \\
PRED \text{‘mother’} \\
\end{array} \right] \\
f_2 : \left[ \begin{array}{c}
PRED \text{‘who’} \\
\end{array} \right] \\
\end{array}
\]

\[
\text{‘greet< f}_1, f_2 >’
\]
Bresnan (1995) continued

For Bresnan, coreference phenomena are broadly constrained by two principles:

1. Syntactic rank comes from the functional hierarchy: \( \text{SUBJ} > \text{OBJ} > \text{OBL} > \text{COMP} \) (from Bresnan)

2. Linear order is governed by f-precedence:

\[
\mu \text{ is the mapping from c-structure nodes to f-structures, and } f \text{ and } g \text{ are f-structures. Then } f \text{ f-precedes } g \text{ iff } \mu^{-1}(f) \neq \emptyset, \mu^{-1}(g) \neq \emptyset, \text{ and all nodes in } \mu^{-1}(f) \text{ precede some node in } \mu^{-1}(g).
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- **Linear order** is governed by **f-precedence**:

  Let $\mu$ be the mapping from c-structure nodes to f-structures, and $f$ and $g$ be f-structures. Then $f$ f-precedes $g$ iff $\mu^{-1}(f) \neq \emptyset$, $\mu^{-1}(g) \neq \emptyset$, and all nodes in $\mu^{-1}(f)$ precede some node in $\mu^{-1}(g)$
Prominence constraints

To avoid a weak crossover violation for Bresnan (1995), a \textit{wh}-question with coreferenced operator and pronoun must obey the following “prominence” constraints.

- **Syntactic prominence:**
  An f-structure containing the pronoun may not be higher in syntactic rank than an f-structure containing the operator.

- **Linear prominence:**
  The pronoun must not f-precede the operator.

*(Bresnan argues that the relative significance of these constraints varies crosslinguistically. Both must be satisfied in English.)*
Example (3) is ungrammatical because it violates both prominence constraints:

- The operator is in the OBJ f-structure, and the pronoun is in higher-ranked SUBJ
- The pronoun appears before the trace (which is in the same f-structure as the operator) and so f-precedes the operator
Example (3) is ungrammatical because it violates both prominence constraints:

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On the other hand, (2)b is fine:

Example (2)

b. Who$_i$ ($t_i$) greeted his$_i$ mother?

The operator has rank SUBJ, while the pronoun is in OBJ; since both operator and trace occur before the pronoun, linear prominence is satisfied as well.
Dalrymple, Kaplan & King (2001) propose a revision of Bresnan’s account that maintains the idea of prominence constraints but eliminates the need for a trace. This is based on Kaplan & Zaenen’s (1989) treatment of long-distance dependencies via functional uncertainty.
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The idea underlying the revision is that “linear prominence requirements between an operator and a pronoun are determined by overt material which indicates the syntactic role of the displaced phrase,” rather than by the position of a covert trace.
Example (4)

a. *Whoᵢ did hisᵢ mother greet?

b. [Diagram of syntactic structure]

c. [Structured representation]

C- and f-structures for (3) (Dalrymple et al)
Example (5)
*Who; did Sue talk about his; mother to \((t_i)\)?
Dalrymple et al continued

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*Who\textsubscript{i} did Sue talk about his\textsubscript{i} mother to \((t_i)\)?

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- Both extracted element are pronoun are OBL; (5) is fine on syntactic prominence
- For Bresnan: the trace is at the end of the sentence, so the pronoun f-precedes the operator
- Dalrymple et al instead consider the overt preposition “to” – the revised proposal holds that the presence of “to” after the pronoun is what rules (5) out.
Revised prominence constraints

Dalrymple et al introduce coarguments to handle this formally:

- The **coarguments** of a predicate (e.g. “talk”) are all of its adjuncts and arguments.
- **CoargPro** is the coargument f-structure containing the pronoun
- **CoargOp** is the coargument f-structure containing the operator
Revised prominence constraints

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- CoargOp is the coargument f-structure containing the operator.

The prominence contraints are then:

- **Syntactic prominence:** CoargOp must be at least as high as CoargPro on the functional hierarchy.
- **Linear prominence:** CoargOp must f-precede the pronoun.
Revised prominence constraints

Example (5)

*Who* did Sue talk about his mother to (\(t_i\))?  

\[
\begin{align*}
\text{PRED} & : \text{`}\text{talk} < \text{SUBJ}, \text{OBL}_{\text{to}}, \text{OBL}_{\text{about}} >` \\
\text{FOCUS} & : f_1 : [ \text{PRED} `\text{who}` ] \\
\text{SUBJ} & : [ \text{PRED} `\text{Sue}` ] \\
\text{OBL}_{\text{to}} & : \text{OBJ} \quad f_1 \\
\text{OBL}_{\text{about}} & : \text{OBJ} \\
\text{SPEC} & : [ \text{PRED} `\text{pro}` ] \\
\text{PRED} & : `\text{mother}`
\end{align*}
\]

- CoargOp is the f-structure OBL\(_{\text{to}}\); CoargPro is OBL\(_{\text{about}}\)
- CoargOp contains both the “to” and “who” nodes
- The pronoun precedes “to,” so CoargPro f-precedes CoargOp, and (5) violates linear prominence
Dalrymple et al continued

Example (6)
Who did Sue talk to about his mother?

The revised constraints correctly predict grammaticality here. They also make the correct predictions for (2)b and (3):

Example (2)

b. Who greeted his mother?

Example (3)

*Who did his mother greet?
A “direct” account

Pickering & Barry’s (1991) “Direct Association Hypothesis” proposes that a link is made directly between an extracted element and the predicate or proposition that selects for it.

Example (6)
Who i did Sue talk to about his i mother?

A direct link between the operator and the item selecting for it captures Dalrymple et al’s intuition about “overt” syntactic information, but eliminates the need for coargument structure. Following Dalrymple & King (2013), the subcategorizing element will be referred to as the anchor.
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Weak crossover by direct association

Example (7)
*[Who\(_i\)]\(_{Op}\) did [his\(_i\)]\(_{Pro}\) mother [greet]\(_{Anch}\)?

Example (8)
[Who\(_i\)]\(_{Op}\) [greeted]\(_{Anch}\) [his\(_i\)]\(_{Pro}\) mother?

Example (9)
*[Who\(_i\)]\(_{Op}\) did Sue talk about [his\(_i\)]\(_{Pro}\) mother [to]\(_{Anch}\) ?

Example (10)
[Who\(_i\)]\(_{Op}\) did Sue talk [to]\(_{Anch}\) about [his\(_i\)]\(_{Pro}\) mother?

In (7) and (9) alone, the anchor follows the pronoun. These are the examples involving weak crossover violations.
Re-revised prominence constraints

According to the observation above, I revise linear prominence as follows:

- **Linear prominence**: the anchor (of the operator) must precede the pronoun.

Syntactic prominence remains as in Bresnan 1995:

- **Syntactic prominence**: An f-structure containing the pronoun may not be higher in syntactic rank than an f-structure containing the operator.
Additional data

Example (11)
[To whom$_i$]$_{Op}$ did you [give]$_{Anch}$ [her$_i$]$_{Pro}$ book ($t_i$)?

Example (12)
[In whose$_i$ hand]$_{Op}$ did you [put]$_{Anch}$ [his$_i$]$_{Pro}$ pen ($t_i$)?

Example (13)
(?) [To whom$_i$]$_{Op}$ did you [introduce]$_{Anch}$ [her$_i$]$_{Pro}$ neighbors ($t_i$)?

- Bresnan predicts ungrammaticality here
- The anchor account predicts acceptability
- Judgements elicited from speakers of American English have (11) ruled grammatical, (12) ruled grammatical by a majority, and (13) ruled grammatical half the time
Double object constructions

The dative alternation:

Example (14)

a. John gave Mary the book.
b. John gave the book to Mary.

▶ The status of the objects in (12) and (13) is similarly debated; Dryer (1986) suggests “split objectivity.”
▶ English double objects may be ambiguous in mental representation; this uncertainty about syntactic rank is reflected in judgements for (11)-(13).
Additional data continued

Example (15)
[Whose$_i$ book]$_{Op}$ did you [give]$_{Anch}$ [her$_i$]$_{Pro}$ friend ($t_i$)?

Example (16)
[To whom$_i$]$_{Op}$ did Sue [talk]$_{Anch}$ ($t_i$) about [his$_i$]$_{Pro}$ mother ($t_i$)?

▶ (15) unequivocally supports the anchor account over the trace account
▶ (16) has an ambiguous extraction site – maybe itself a mark against the trace account
▶ On the whole, separating anchor and trace favours anchor account
Objectivity distinctions

Example (17)

a. (?) \([\text{Who}_i]_{\text{Op}} \text{ did you } [\text{give}]_{\text{Anch}} (t_i) [\text{her}_i]_{\text{Pro}} \text{ book?}\\

b. (?) \([\text{Whose}_i \text{ book}]_{\text{Op}} \text{ did you } [\text{give}]_{\text{Anch}} [\text{her}_i]_{\text{Pro}} (t_i)\\

- (17)a and b both satisfy linear prominence on the anchor account
- Direct objectivity would block (17)a on syntactic prominence, and permit (17)b
- Primary objectivity would allow (17)a and block (17)b
Adjuncts and syntactic prominence

Example (18)
*\([\text{With whom}_i \text{Op}} \text{ did Jessica [visit]_{(\text{Anch})} [\text{his}_i \text{Pro}} \text{ cousin (}t_i\text{)}?\]

Example (19)
*\([\text{In whose}_i \text{ car} \text{Op}} \text{ did Anne [meet]_{(\text{Anch})} [\text{him}_i \text{Pro}} (}t_i\text{) ?}\]

Example (20)
*\([\text{From whose}_i \text{ house} \text{Op}} \text{ did George [call]_{(\text{Anch})} [\text{her}_i \text{Pro}} (}t_i\text{) ?}\]
Multiple anchor sites

Parasitic gaps (Engdahl 1983):

Example (21)

(?) Who did you advise $t_i$ before his wife divorced $i,p$?
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(?) Who did you advise $t_i$ before his wife divorced $___i,p$?

Tough construction:

Example (22)
Who $t_i$ will be easy for us to get his mother to talk to $t_i$?
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Example (21)
(?) Who\textsubscript{i} did you advise $t\textsubscript{i}$ before his\textsubscript{i} wife divorced \textsubscript{--i,p}?

Tough construction:

Example (22)
Who\textsubscript{i} $t\textsubscript{i}$ will be easy for us to get his\textsubscript{i} mother to talk to $t\textsubscript{i}$?

- Bresnan 1995 rules these out
- If first possible anchor site is correct, anchor account predicts acceptability
Conclusions

Directions for further inquiry:

- Crosslinguistic data

- Data from languages with less rigid word order would help in establishing (or rejecting) validity of a direct association principle

- If anchor account is viable, could shed light on differences between the mental representations of adjuncts and arguments; also the status of objectivity w.r.t. the functional hierarchy

- Within English
  - Can the anchor account handle examples involving quantification, rather than wh-movement?

- Other coreference phenomena (e.g. strong crossover)

- Formalization (within LFG and other frameworks)
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Synthetic data

Following Dalrymple et al, I present “data” from hypothetical languages that would help to adjudicate between the three accounts. These are not exhaustive.
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Example (23)
Only linear prominence applies; fixed SVO word order, *wh*-fronting:

\[ [[\text{who}_i]_{\text{Op}}]_{\text{CoargOp}, \text{OBJ}} \text{ did } [[\text{his}_i]_{\text{Pro}} \text{ mother}]_{\text{CoargPro}, \text{SUBJ}} \text{ [see]}_{\text{Anch}} (t_i) ? \]

- Ungrammatical for Bresnan
- Grammatical for Dalrymple et al
- Anchor agrees with Bresnan (anchor and trace adjacent)
Synthetic data continued

Example (24)
Only linear prominence applies; fixed SOV word order, \textit{wh}-fronting

\begin{itemize}
\item[a.] \([[[\text{who}_i]_{\text{Op}}]_{\text{CoargOp}}, \text{SUBJ} \ (t_i)] [[[\text{his}_i]_{\text{Pro}} \ \text{mother}]_{\text{CoargPro}}, \text{OBJ} [\text{saw}]_{\text{Anch}} ?
\item[b.] \([[[\text{who}_i]_{\text{Op}}]_{\text{CoargOp}}, \text{OBJ} [[[\text{his}_i]_{\text{Pro}} \ \text{mother}]_{\text{CoargPro}}, \text{SUBJ} \ (t_i) [\text{saw}]_{\text{Anch}} ?
\end{itemize}

▶ Extraction from subject position gives grammaticality from Bresnan and Dalrymple et al
▶ (24)a ungrammatical by anchor account; verb at the end of the sentence
▶ Extracting from object position gives ungrammaticality from Bresnan; others are unchanged
Synthetic data continued

Example (25)
Only linear prominence applies; fixed VSO word order, wh-fronting:

\[
[[\text{who}_i]_{\text{Op}}]_{\text{CoargOp, OBJ}} \ [\text{saw}]_{\text{Anch}} \ [[\text{his}_i]_{\text{Pro}} \ \text{mother}]_{\text{CoargPro, SUBJ}} (t_i) ?
\]

- Grammatical for Dalrymple et al and anchor account (anchor occurs early)
- Ungrammatical for Bresnan
Synthetic data continued

Example (26)
Both linear and syntactic prominence must be satisfied; fixed SOV word order, \textit{wh}-fronting:

\[
[[\text{who}_i]_{\text{Op}}]_{\text{CoargOp}}, \text{SUBJ } (t_i) [[\text{his}_i]_{\text{Pro}} \text{ mother}]_{\text{CoargPro}}, \text{OBJ } [\text{saw}]_{\text{Anch}}
\]

- Grammatical for Dalrymple et al and Bresnan
- Word order constraints have anchor at the end of the sentence; anchor account predicts ungrammaticality
Lastly, suppose there is a language which requires only that one of the constraints be satisfied. If an example satisfies syntactic prominence here, all three accounts will predict grammaticality; thus it is only helpful to consider violations of syntactic prominence to adjudicate between accounts. Using linear prominence alone gives the same predictions as in (23)-(25), modulo word order.
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- The anchor account apparently handles all data explained by Bresnan and Dalrymple et al.
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Conclusions:
- Traces are not strongly motivated by weak crossover
- The association needs further exploration (particularly with respect to double objects, multiple gaps)
- This paper provides a starting point for a more formal theory of direct association
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